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Q Fever Studies in Southern California

II. An Epidemiological Study of 300 Cases [1]

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Q fever was first recognized in California in April 1947, by Young (*1*). Shepard and Huebner confirmed the diagnosis by recovering *Coxiella burneti* from the blood of four cases and by finding specific complement fixing antibodies in the blood serum of 17 cases (*2*). The occurrence of these cases in southern California did not follow the epidemiological pattern previously described in Q fever outbreaks (*3, 4, 5*). The present report will show that the total 300 cases now recognized in this area have occurred over a long period of time in the general population; they have not occurred as a self-limited epidemic confined to a specific occupational group. In view of this unusual occurrence the United States Public Health Service, the California State Departments of Public Health and Agriculture, and the Los Angeles City and County Health Departments have undertaken rather extensive studies of the disease. These studies began in September 1947, and are still underway as a cooperative project. They are concentrated in the city and county of Los Angeles but extend to adjacent counties when indicated by epidemiological considerations. The aim of these studies is to determine the modes of spread of the infection and the chief source of human disease.

The first in this series of reports described the recovery of *C. burneti* from 40 out of 50 specimens of raw milk collected on five dairies (*6*). The present report deals with the preliminary observations of the disease in persons. The search for cases, the diagnostic criteria, and some of the clinical and laboratory characteristics of recognized cases are described. Then an analysis is made of the epidemiological char-

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acteristics of cases in order to derive hypotheses as to the possible sources and modes of spread of infection. Several hypotheses have been derived and specific epidemiological surveys are being carried out to test their worth. These specific surveys will be the subject of future reports.

Case Finding

The difficulties of case finding are manifold. In the first place the disease is relatively new; it is not reportable in California and it is not readily recognized clinically. In addition, no specific therapy of proved value has been reported to date; a patient is usually well by the time present laboratory procedures can be completed to establish a definite diagnosis; and a person ill with the disease is not likely to transmit it to his contacts (*3, 7*). Furthermore, other investigators (*7, 8*) who have studied the spread of the infection have found many of the resulting cases so mild that their clinical aspects alone would not have suggested Q fever.

In full appreciation of these difficulties in case finding, this study has not made an all-out effort to locate all cases occurring in the more than four million people who live in the Los Angeles area. It is believed that the 300 cases found constitute only a small sample of the total number of cases which have occurred and it is further believed that these cases are not necessarily representative of the natural occurrence of the disease in this area. The number of cases found by any one case-finding method appeared to depend upon the amount of effort expended. Thus, it is necessary to be ever cognizant of the methods used to locate cases when evaluating the general significance of the study findings.

The following methods were used to locate the cases reviewed in this report:

(*a*) In general, talks on Q fever were delivered at meetings of county medical societies, groups of doctors, hospital staffs, and health officers, to stimulate interest in the study of this disease and in the differential diagnosis of possible cases.

(*b*) Visits were made to physicians to inform them of the presence of the disease in this area, its clinical manifestations and the laboratory procedures required for a definite diagnosis. Inquiries were made regarding cases of atypical or virus pneumonia which had occurred in their practice. It was requested that samples of blood be obtained from such cases for a Q fever complement fixation test and that all cases be reported to the laboratory for epidemiological investigation.

(*c*) Case records of various hospitals were searched for possible cases, and hospital staffs and laboratories were requested to send

acute and convalescent blood specimens on all patients having pneumonia to the Q fever laboratory for complement fixation tests.

(*d*) Various industries concerned with the handling of livestock were visited and inquiries made as to the existence of unusual illnesses suggestive of Q fever.

(*e*) The local health departments who cooperated in this study sent the names of suspected cases and blood sera to the Q fever laboratory for investigation and study.

(*f*) When cases were located, inquiries were made as to knowledge of similar illnesses among their acquaintances, and these were investigated when the symptoms suggested Q fever.

(*g*) An epidemiological analysis of the first 116 cases (*9*) found by the above methods suggested certain specific epidemiological surveys. Although these surveys are not discussed in this paper all cases encountered are included in this report inasmuch as their epidemiological attributes were not essentially different from the first 116 cases.

Diagnostic Criteria

A definite diagnosis of Q fever requires that either *C. burneti* be isolated from the patient's blood, secretions, or tissues, or specific antibodies must be shown to develop in the blood serum of the patient during the course of the disease. The complement fixing antibodies which result from *C. burneti* infection are considered specific (*3*, *11*); they rarely cross react with other rickettsial infections and have not been found in other febrile illnesses. These specific antibodies may persist for many years (*11*). The 300 cases included in this report had a definite diagnosis as described above or had a clinical illness consistent with Q fever and specific complement fixing antibodies in their blood serum. They were classified as follows:

(*a*) Recovery of *C. burneti* from tissues at autopsy (2 cases), from blood of acutely ill patients (7 cases), and from urine of a convalescent patient (1 case). These 10 recoveries of *C. burneti* resulted from 18 attempts to isolate the organism in various stages of illness. No effort was made to determine the proportion of patients from which the organism could be recovered.

(*b*) A fourfold rise of complement fixing antibody titer in paired specimens of blood serum taken in the acute and convalescent stage of illness (98 cases, 7 of which are included in (*a*) above).

(*c*) A complement fixing antibody titer of 3+1:32 or higher, in blood specimens taken during convalescence or later in the disease (181 cases, 1 of which is included in (*a*) above).

(*d*) A complement fixing antibody titer of 3+1:8, or higher, but less than 3+1:32 in blood specimens taken months or years after illness (19 cases).

Each of the above groups of cases was tabulated separately for every epidemiological analysis made. In every instance these epidemiological attributes were distributed in a random manner between the groups. Table 1 exemplifies the analyses carried out. It specifically shows that the age distribution of cases was similar in each of the four groups. Attributes other than age, e. g., sex, race, occupation, residence, milk supply and date of onset of illness were tabulated in a similar manner and in every instance the distribution among the four groups was well within the range of chance sampling variation. Since criteria (*a*) and (*b*) are accepted to represent Q fever, a single entity, the above distributions would be difficult to explain if (*c*) and (*d*) do not by and large represent the same entity. Hence, for the purpose of this paper the cases in all four groups are treated as cases of Q fever.

Table 1. *Distribution of cases by age and diagnostic criteria*

Years of age	Diagnostic criteria *				Total cases
	A	B	C	D	
<30	1	27	51	5	84
30–49	8	45	97	11	161
>49	1	19	32	3	55
Total	10	91	180	19	300

* See text for definition.

Clinical Observations

Detailed clinical findings are not presented on all cases because some of the clinical records taken at the time of illness, particularly on the early cases, were not available and others were incomplete. Furthermore, a detailed report on 80 of the hospitalized cases is being published by Denlinger (*10*).

The incubation period has been reported by other investigators (*3*, *4*, *7*) to range from 14 to 32 days. In this study the following single exposures to a likely source of infection were noted: Three patients began using raw milk 2 weeks before onset; three patients began using raw milk 3 weeks before onset; an insurance man visited a dairy barn 14 days before onset; an electrician wired a dairy barn 16 days before onset; a person seeking employment visited a slaughter house 2 weeks before onset; a dairyman began work on a particular dairy 10 days before onset, whereas, three others began work 1 month before onset; a person installed radio equipment in a dairy barn 1 month before onset; and one person began working in a fat rendering plant 4 weeks before onset. These 15 cases suggest that the incubation period ranges from 10 days to 1 month which is compatible with published reports.

In this series the onset of Q fever was generally sudden. Occasionally, however, prodromal symptoms of malaise and anorexia were present for 24 to 48 hours. The most frequent initial symptoms were headache, myalgia, anorexia, chilly sensations and fever.

The fever ranged from 100–101° to 104–105°, fluctuating one or more times daily. A relative bradycardia was usually present and, except in the cases with widespread pneumonitis, the respiratory rate was normal or only slightly increased. The more severely ill patients with pneumonitis presented a cough, occasionally with hemoptysis and chest pain often referred to the site of the infiltration. Dullness, increased fremitus, bronchial breathing and rales were usually present when the infiltration was extensive.

A red maculo-papular rash which blanched on pressure was observed in 17 cases. It may have occurred in others unnoticed. The lesions were 2–3 mm. in diameter and were sparsely distributed over the trunk. They were observed on the fifth to eighth day of illness and persisted only a few days. Their diagnostic significance is questionable.

The severity and the duration of the disease varied greatly. Some patients required prolonged hospitalization while others were only slightly incapacitated. The duration of fever was from 1 to 35 days, the average being 9 days. The temperature usually subsided by lysis. Most patients recovered quickly after defervescence but many of the severe cases had weakness for 2 to 3 weeks. Weight loss of 5 to 15 pounds was not unusual in severe cases.

The complications were incompletely recorded, however pleural effusion was noted in three cases, hepatomegaly in four cases, and one case each of transient epididymitis and orchitis was observed. A recurrence of fever was noted in four cases and this was associated with extension of pneumonitis in one case and onset of a pleural effusion in another. Ten of the seriously ill patients are known to have had toxic psychoses with disorientation and hallucinations and occasionally nuchal rigidity. Three patients complained of aching in the legs for 2 weeks, one month, and 8 months, respectively. It may be of interest that one patient had a preexisting silicosis, three had preexisting tuberculosis and two had preexisting Hodgkin's disease.

Aside from the complement fixation and sedimentation tests other laboratory findings were essentially negative. The results of the complement fixation tests will be described later. Sedimentation rates were moderately increased during the acute stage of the illness. The white blood counts and urine analyses were generally within normal limits. No cold agglutinins were demonstrable. Sugar and protein levels and cell counts were normal in the spinal fluid of 15 patients.

Roentgenologic evidence of pneumonitis, often described by roentgenologists as the "atypical" type was present in 97 of 115 cases

X-rayed. Of these 97 cases, physical findings were noted in the thorax of 89 but such findings were also noted in 10 of the 12 whose roentgenograms were normal.

A differential diagnosis is often difficult to make in the early stages of Q fever. The milder cases were usually thought to have the "flu". The more severe cases were commonly diagnosed as primary atypical pneumonia. The illnesses most frequently confused with Q fever in this area are exemplified in the following list showing the diagnoses considered by the physician on first seeing the patient:

	Cases		*Cases*
Primary atypical pneumonia	70	Typhoid fever	3
Q Fever	69	Typhus	3
Pneumonia (broncho and lobar)	37	"Virus infecton"	2
Influenza	21	Infectious mononucleosis	2
F.U.O. (fever of undetermined origin)	14	Staphylococcus septicemia	1
Brucellosis	8	Brain abscess	1
Meningitis	4	Tuberculosis	1
Poliomyelitis	4	Bronchogenic carcinoma with abscess	1
Malaria	3	No diagnosis or unknown	56

Three deaths have occurred in recognized cases. One was complicated with Hodgkin's disease, one was complicated with a healed myocardial infarction and the third gave a history of a chronic illness with recurring fever since 1943. This case will be discussed in a future report. It is noteworthy that several persons have been found with a chronic febrile illness dating back to a proved attack of Q fever.

Laboratory Findings

In the California series of 300 cases a total 483 complement fixation tests have been made. Table 2 shows the distribution of titers, expressed as a percent of the number of tests made at various periods of time after onset of illness. The method of case finding and the fact that paired specimens were taken in the acute and convalescent stages of the disease in 98 cases contributes to the uneven distribution of the number of tests made in each time interval. The column "percentage negative" shows for each time period the proportion of tests in which there was no fixation whatsoever or in which the titer was less than 3+1:8. These percentages decrease progressively as the time from onset increases. The columns showing percentages of persons having complement fixing antibodies at various times after onset are self-explanatory. The extremes of the distribution are noteworthy. Thirteen percent (6/45) of persons tested during the first 6 days of illness had complement fixing antibodies. Six percent (6/105) of persons tested during the period 11–21 days of illness had no complement fixing antibodies. These extremes may possibly represent

individual variation in speed of antibody response or they may represent inaccurate dates of onset. The latter were rechecked and no more accurate information was available. In general, table 2 shows that both the proportion of persons with antibody titers and the height of the titers increase progressively from onset until the fourth week of illness; thereafter, the proportion with high titers gradually decreases.

Table 2. *Distribution of 483 complement fixation titers for Q fever expressed as a percent of the number of tests made at various periods after onset of illness (300 cases)*

Periods of time after onset	Number tests	Percent negative	Percent with 3+ fixation at specified dilution or higher*			
			1:8	1:16	1:32	1:64
Days						
1–2	7	100	0	0	0	0
3–4	17	88	12	0	0	0
5–6	21	81	19	19	14	10
7–8	28	46	54	43	32	21
9–10	38	29	71	63	53	34
11–12	18	11	89	78	78	72
13–14	21	14	86	86	86	67
15–21	66	2	98	95	91	85
22–30	36	0	100	100	97	94
Months						
1–5	128	0	100	100	95	80
6–11	34	0	100	97	94	88
Years						
1	46	0	100	100	85	63
2–7	23	0	100	100	65	61

*No titrations were made at dilutions greater than 1:64

Epidemiological Findings

The geographic distribution of cases was to some extent dependent upon the intensity of search for cases in a particular area. Of the 300 cases, 282 have occurred in Los Angeles County, 10 in Orange, 4 in San Diego, 2 in San Bernardino, and 1 each in Santa Barbara and Ventura Counties. The map illustrates the general distribution of cases in Los Angeles County and part of Orange County. It shows that the cases are fairly widely distributed. The map does not give the varying density of population but no apparent correlation existed between density of population and density of cases. In general, there are three concentrated foci of cases, namely, in the Artesia area where the disease was first recognized, in the Downey area where the Q fever laboratory is located and in the Tarzana area where intensive studies were carried out in connection with a large dairy. Quite aside from these three areas there appears to be an unusual concentration of cases in close geographical association with dairies. The rapidly expanding cities have built up adjacent to the corrals of the many dairies in this area.

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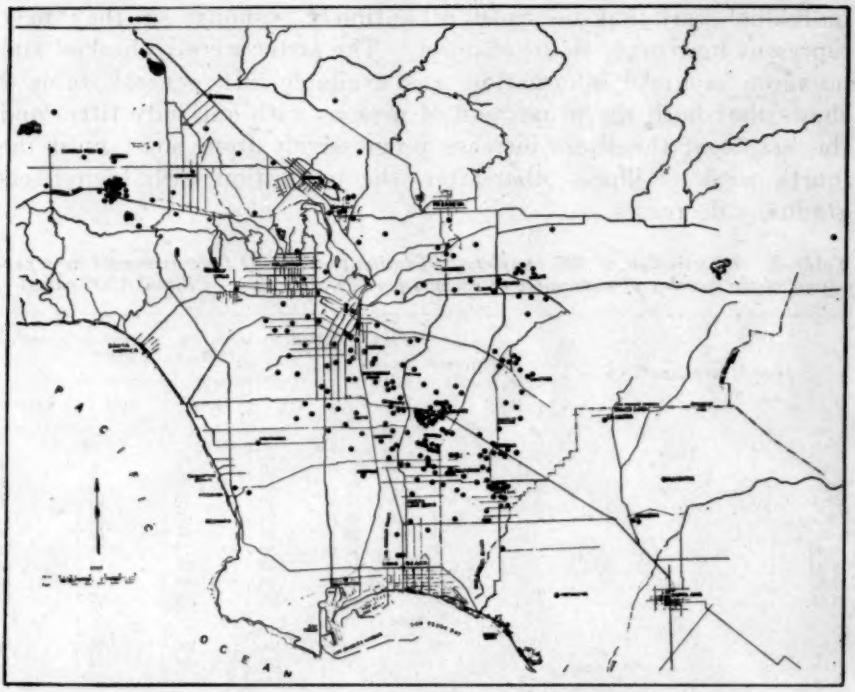

Q fever cases in Los Angeles County and vicinity.

In table 3 are the total number of cases by month and year of occurrence as obtained by history. It appears that Q fever has existed in this area for a number of years and the evidence indicates that the presently occurring cases are merely a part of a recently recognized but long standing endemic pattern. Table 3 also shows that a sizable proportion of the cases have occurred in every month of the year. The seasonal variation in the number of cases located by the case finding methods used in this study was so slight that a larger experi-

Table 3. *Distribution of cases by months and years of occurrence*

Month	Years					Total
	1941–44	1945	1946	1947	1948	
January				3	14	17
February	1	1	2	9	14	27
March	1	1	2	6	15	25
April		1	2	12	14	29
May			2	13	18	33
June	2		3	14	9	28
July			3	14	3	20
August		1	5	20		26
September		1	3	21		25
October		1	5	21		27
November	3	1	2	26		32
December		1	2	8		11
Total	7	8	31	167	87	300

ence would be necessary to determine the true seasonal pattern, if one exists in this area.

Cases were observed in both sexes, in various races and at ages varying from 3 to 75 years. Table 4 shows the distribution of cases by sex and age. Twenty-one percent of the cases were in females. This is small as compared with the nearly equal sex distribution of the general population but it is large when compared with the cases reported in the literature (*11*). By age, 91 percent of the cases occurred in the 20–59-year age groups. This is large when compared with the general population of this region, 60 percent, but not greatly different from cases reported in the literature (*11*). Of the 300 cases, 286 were whites including 7 Indian-Mexican, 13 were Negro, and one was Chinese. Aside from the fact that three races were afflicted no particular significance can be attached to the race distribution.

Table 4. *Distribution of cases by age and sex*

Age group	Male	Female	Total number M and F	Percent of cases	Percent of Los Angeles population*
0–19	8	4	12	4	26
20–29	58	13	71	24	17
30–39	77	19	96	32	17
40–49	50	16	66	22	15
50–59	31	7	38	13	12
>59	13	4	17	5	13
Total	237	63	300	100	100
Percent	79	21	100		

*Sixteenth census of the Los Angeles metropolitan area.

In evaluating the age, sex, and race distribution, consideration should be given to the possibility that certain age, sex, or race groups (e. g. children, females, etc.) may tend to have mild or inapparent infections and, if so, they would have been unlikely to come to the attention of this study. Furthermore, the methods used for case finding might possibly produce a study group of cases with an age, sex, and race distribution somewhat like that observed; however, it is doubted that this alone would produce a case distribution so markedly different from that of the general population as shown in table 4. When cases were arranged by year of onset the age, sex, and race distribution was not significantly different from the total shown in table 4. The age, sex, and race distribution suggests that industrial occupation may be an important source or mode of spread of the disease.

The diverse occupational distribution, tabulated below, is remarkable when compared with the usually reported outbreaks limited to employees of stockyards, abattoirs, dairies and laboratories (*3, 4, 5, 8, 18*). As compared with the general population there appears to be an unusually

high occurrence among workers in the livestock industry. On the other hand the large number of cases that occurred among persons having no association with the livestock industry suggests that the sources of infection or modes of spread of the disease are by no means limited to specific industrial occupations.

An analysis of the occupational history showed that the cases were distributed among 60 different occupational groups as follows:

Dairymen	*46	Retail meat market employees	3	Rabbit raiser	1
Housewives	45	Milk testers	2	Kennelman	1
Metal tradesmen	18	Children	2	Road construction worker	1
Fat rendering plant workers	17	Veterinarians	2	Rubber company employee	1
Building tradesmen	15	Autopsy room assistants	2	Dress manufacturer	1
Creamery workers	12	Chemists	2	Hod carrier	1
Salesmen	11	Waitress and waiter	2	Installer of venetian blinds	1
Mechanics	11	Service station attendants	2	Installer of church fonts	1
Students	11	Radio technicians	2	Fish hatchery worker	1
Packing plant workers	9	Patrolmen	2	Film technician	1
Agricultural workers	6	Dairy inspector	1	Insurance salesman	1
Truck drivers	6	Meat inspector	1	Dress fitter	1
Electricians	5	Sheep shearer	1	Showman	1
Doctors of medicine	5	Hide house worker	1	Actress	1
Clerical workers	5	Doctor of osteopathy	1	PBX board operator	1
Oilfield workers	4	Dentist	1	Hotel night clerk	1
Livestock workers	4	Upholsterer	1	Library cataloguer	1
Railroad workers	3	Baker	1	Assistant water superintendent	1
Teachers	3	Druggist	1	Unemployed	6
Engineers	3	Poultry raiser	1		
Nurses	3				
Feed mill workers	3				

*Three were workers on a goat dairy.

Possible Sources and Modes of Spread

There is good epidemiological evidence in the literature (*3*, *7*) that Q fever is rarely, if ever, transmitted directly from one human to another. In the investigation of each individual case in this study it was rare to obtain a history of prior contact with another case during the probable incubation period of the disease. A search was made for additional cases in the household of each patient and in many instances blood specimens were tested on all members of the family. Multiple cases occurred in the same household in only six instances. These are summarized together with the history of all known exposures to possible environmental sources of infection as follows:

(*a*) A man and his wife in the same household had their onsets 1

day apart. For 1 month prior to onset of illness they had both been working on a dairy and using raw milk from that dairy.

(*b*) A man and his wife in the same household had their onsets 4 days apart. The husband was a gardener (agricultural worker) and handled considerable fertilizer in his work.

(*c*) A husband and wife living in the same household had their onsets 3 weeks apart. They had moved to a street across from a dairy 1 month before the husband's onset—a street where three other cases had developed. The husband's brother came to visit them often while he was ill and the brother developed Q fever about 6 weeks after the initial case. One boy 8 years old was not ill.

(*d*) At a home for old men, one frank clinical case developed in a man 54 years old who had been there 1 month. The home was located near several dairies and raw milk was used. Two men, aged 65 and 75, who had not been ill but who lived in the same abode were found to be positive for Q fever in high titer by complement fixation test. These men may have had inapparent infections.

(*e*) A husband and wife living in the same household had their onsets on the same day. They were not exposed to any known likely source of infection.

(*f*) Of six members of a white family living in one household, four had onsets of illness within 8 days of each other. The 2-month-old infant had not been ill and was not bled.

Name	*Age*	*Sex*	*Date of onset*	*Type of illness*	*Date C–F test*	*Result*
1. H. H.	54	M	.....	No illness	6/17/48	4+1:64
2. T. G.	23	M	6/1/48	Hospitalized, severe	6/10/48	4+1:64
					6/17/48	4+1:64
3. I. H.	46	F	6/2/48	In bed at home, severe	6/10/48	3+1:64
					6/17/48	4+1:64
4. E. G.	25	F	6/2/48	F. U. O. fever, chills, headache, for 1 day, mild.	6/17/48	3+1:32
5. L. H.	3	M	6/9/48	F. U. O. headache, fever 3–4 days, mild.	6/17/48	4+1:64
6. B. G.	3½	M	.....	No illness	No specimen	.....

This household presented various degrees of infection from no illness to illness severe enough for hospitalization. H. H. who was not ill had been buying calves at the dairies in the Artesia district for 2½ months prior to June and delivering them to packing houses. His clothes, often soiled with calf excreta, were brought into the house. I. H. had ridden in the truck 1 month prior to illness and T. G. had also ridden in the truck.

The above 6 instances which comprise only 14 of the total 300 cases are far below that which would be expected if person-to-person contact were an important source of human disease. In addition, the interval between dates of onset of cases occurring in the same household is much shorter than the usual incubation period of 10–32 days. This suggests a common source of infection, rather than a direct person-to-person mode of spread. Furthermore, the age, sex, geo-

graphic, seasonal and occupational distribution of the cases indicated that a person-to-person mode of spread of the disease is of little or no consequence in this endemic area.

The case distributions and case histories suggest that the human disease results from contact with some natural source of infection in the environment. Some animal or arthropod reservoir of infection seems likely inasmuch as *C. burneti* has been cultivated only in the presence of living cells and efforts to produce growth in an inanimate media have been unsuccessful. Direct human contact with an animal or arthropod source of infection would not appear to be essential since *C. burneti* is very resistant to physical and chemical agents as compared with other pathogenic micro-organisms (*12*). Even though this organism may not multiply in the inanimate environment it could persist as a possible source of infection in such an environment for a long period of time.

At first glance a blood sucking arthropod would seem to offer a likely source or mode of spread of infection in humans because (*a*) *C. burneti* is present in the blood stream of humans ill with the disease and thus they presumably may be infected by this route; (*b*) other rickettsial diseases are known to be transmitted by blood sucking arthropods, and (*c*) *C. burneti* has been found to occur naturally in five species of ticks, viz., *Haemaphysalis humerosa* (*13*), *Amblyomma americanum* (*14*), *Dermacentor andersoni* (*15*), *Dermacentor occidentalis* (*16*), and *Otobius megnini* (*17*). Two of these ticks have been found naturally infected in this area. *O. megnini*, the spinose ear tick of cattle, has been collected in large numbers on cattle distributed throughout the localities where cases have occurred but this tick rarely bites man. *D. occidentalis* occurs in the nearby hills, quite removed from population centers and geographic areas where cases appear to be concentrated. Also, patients have been questioned with respect to visits to the foothills prior to onset of illness and questioned and examined for evidence of bites from arthropods. Very few had made such visits and extremely few had any recollection of such bites. In these few there was no constant time relation between such bites and onset of illness. Furthermore, the distribution of cases in this area by age, sex, occupation, and season would be difficult to explain if a blood sucking arthropod were an important source of human cases in this locality.

Cows (*6*), sheep and goats (*19*), and bandicoots (*21*) are the animals which are reported to be naturally infected with *C. burneti*. Bandicoots do not exist in the Los Angeles area. Sheep and goats are present but their distribution is not abundant. Complement fixing antibodies for Q fever have been reported in the blood sera of goats in northern California (*20*). Attempts to recover the organism from sheep and

goats in southern California are underway. In the individual case investigations very few contacts with sheep and goats could be elicited. However, the following instances appear significant: (*a*) The owner of a goat dairy developed Q fever presumably 2 weeks after he started to work on the dairy in 1945. Two employees on the same dairy developed Q fever in July 1947; one began employment 1½ months prior to onset and the other 3 months prior to onset. Incidentally, two other employees had similar illnesses with penumonia at the same time but no blood specimens were obtained for complement fixation tests. (*b*) One patient used raw goat's milk continuously for 5–6 years, and one used raw goat's milk in the form of ice cream 2 weeks before onset. (*c*) Two patients were exposed to sheep. One began shearing sheep 10 days before onset of illness, and the other stood by during the unloading of several hundred sheep 2 weeks before onset of illness. Thus sheep and goats may be a potential source of human cases in this area but at this time it seems unlikely that they constitute a major source or mode of spread of the disease.

Dairy cows have been found naturally infected with *C. burneti* in this area (*6*). Reliable estimates indicate that more than 10 percent of such dairy animals have complement fixing antibodies for Q fever in their blood sera and that more than 50 percent of the raw milk produced here contains sufficient amounts of *C. burneti* to produce demonstrable illness when small quantities are injected into guinea pigs. There are some 800 dairies in the city and county of Los Angeles and some 60,000 cows are imported each year. Dairy cows stay in the milking string a comparatively short time, an estimated average of 3 years. From the dairies they go to local slaughterhouses—very few emigrate. Thus dairy cows and raw milk present a tremendous natural reservoir of *C. burneti* in the Los Angeles area.

In consideration of the likely sources of infection every case has been investigated to determine the possible modes of effective contact. Table 5 distributes the cases according to possible contact through residence, occupation and milk supply. In view of the laboratory epidemics (*3*, *22*, *23*, *24*) and the occurrence of the disease in the military groups (*7*, *25*, *26*), an airborne (dust or other particulate matter) method of spread was considered. Cases were classified as to whether they resided within one-quarter of a mile of a dairy or livestock yards. In view of the occurrence of the disease in persons associated with livestock (*4*, *8*), cases were classified as to whether they had occupational contact with livestock (cattle, sheep and goats) and in the processing of their raw products. In view of the prevalence of infection in the raw milk of this area, table 5 also classifies the cases as to whether they used raw milk in their households. The latter classification is justified, since pasteurization, particularly by the short

time high temperature method, has been tentatively demonstrated to reduce the infectivity of milk to an extent where it no longer produces detectable disease when injected into guinea pigs (*6*). Only 286 cases are included in the table because complete information on each of these attributes was not available in all 300 cases.

Table 5. *Distribution of cases according to contact with possible sources of infection through residence, occupation, and household milk supply*

Residence <¼ mile from livestock	Occupation with animals or their products*	Household milk supply		Totals	Sex distribution	
		Raw	Other		Male	Female
Yes	Yes	26	21	47	46	1
	No	20	61	81	54	27
	Total	46	82	128	100	28
No	Yes	13	50	63	63	0
	No	31	64	95	62	33
	Total	44	114	158	125	33
Total	Yes	39	71	110	109	1
	No	51	125	176	116	60
	Total	90	196	286	225	61

* Occupational contact pertains to contact with cattle, sheep, goats and the processing of their raw products.

This table also includes the sex distribution in order to determine whether the over-all preponderance of males might be due to occupational characteristics of the disease. It will be noted that among the 110 cases having occupational contact 109 were males. Among the 176 cases having no such occupational contact 116 or 66 percent were males. Thus the over-all preponderance of males was largely due to a likely occupational source or mode of spread of the disease in this locality.

In table 5, if occupation is hypothecated to be the exclusive mode of spread of the disease in this area, only 38 percent ($^{110}/_{286}$) of the known cases would be accounted for. If living in close association with dairies, or livestock yards, is hypothecated to be the exclusive mode of spread of the disease, then only 45 percent ($^{128}/_{286}$) of the known cases would be accounted for. In a like manner, if the use of raw milk in the household is hypothecated to be the exclusive mode of spread of the disease, then 32 percent ($^{90}/_{286}$) of the recognized cases would be accounted for. When all three of the above possible modes of spread of the disease are considered all but 64 cases are included, accounting for 78 percent ($^{222}/_{286}$) of the total cases. This is a sizable proportion of the known cases when account is taken of the remote date of onset of some cases (table 3) and when it is appreciated that only positive information was classified, i. e., if there was some doubt

as to whether an individual had occupational or other contact, he was classified as having no such contact.

It is further to be noted that with each of the above hypotheses the proportionate distribution of cases far exceeds any liberal estimate of the distribution of the population in the area. Certainly, 38 percent of the people in this area do not have occupational contact with animals and their raw products; 45 percent of the population do not live within a quarter mile of a dairy or livestock yards, and 32 percent of the people do not use raw milk. Actually far less than 5 percent of the milk distributed in the area is unpasteurized. Thus, it is concluded that all three hypotheses are tenable and hence specific epidemiological studies have been set up to examine their worth.

Summary and Conclusions

Three hundred cases of Q fever, with three deaths, have been investigated in Los Angeles and vicinity since September 1947. The method of case finding has been described and the general clinical and laboratory findings and diagnostic criteria discussed. Four hundred eighty-three complement fixation tests were made and, in general, the titers increased from zero to a peak during the fourth week of illness and then tended to gradually subside over a period of years. The cases occurred throughout the area at all seasons and over several years. They were predominantly males in the industrial age groups, however their occupations were extremely diversified. In all, the epidemiological findings suggested three general hypotheses as to the modes of spread of the disease in this endemic area—occupation in the dairy or livestock industries, residence in close approximation to a dairy or livestock yards, and household use of raw milk. No one of these possible modes of spread would account for more than one-half of the cases. Specific epidemiological studies have been arranged to determine the worth of each of these hypotheses.

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Experimental Animal Colony in Tropical West Africa

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The animate agents and vectors responsible for the major infectious diseases of tropical climates are available in abundance to any investigator who comes to the tropics to study them. The malarias, the dysenteries, the helminthiases, trypanosomiasis, and the treponemiases make up the great infectious pentad which contributes greatly to the death and retardation of the native peoples of Liberia and the adjacent areas of West Africa. The colossal waste of human life and energy caused by these diseases, especially in Africa and Asia, stands as a persistent challenge to epidemiologists and public health specialists of the western world. Most of the animate etiological agents and the vectors of this group are well known, but their biology is less well known, and the variable factors in their host-vector-parasite relationships are very poorly understood.

In countries where the so called tropical diseases are most prevalent, the average income and financial status of the population are notoriously low. Any practical solution of the several problems of prevention and control of these tropical diseases must be based upon economic feasibility. The economic factor alone makes further research on host-vector-parasite relationships of paramount importance, since it is essential not only to find a weak point in the cycles but also the most economical key to the problem of prevention and control.

Standard experimental animals in adequate numbers are essential for research in tropical diseases, but in tropical West Africa such animals are not available in adequate numbers at any of the experimental laboratories on the West Coast between Timbuktu and the equator. For those not experienced in breeding animals for experimental use it might appear that to maintain a healthy colony would not be too difficult. The fact is, however, that the problem is a very difficult one, and the several laboratories engaged in biological studies requiring large numbers of experimental animals order them from Europe or America. This expensive item has retarded large scale experimentation in this part of Africa.

In January 1947, the Public Health Service and the writer undertook to study the possibilities of maintaining a colony of experimental animals in Liberia, using local food and native labor. The animals were to be used to supply the various research projects of the Public

[1] This work was done while serving as Chief, Laboratory and Medical Research of a United States Public Health Service Mission in Liberia, 1947 and 1948.

Health Service Mission in Liberia. This paper deals with observations and problems of maintaining this colony in Liberia during the first 18 months of its operation.

Equipment and Animal Colony Composition

The colony in Liberia was started with healthy animals from the stock colonies of the National Institutes of Health laboratories at Bethesda, Maryland. The writer accompanied the initial shipment of four cages by Pan American Airways from New York City to Robert's Field, Liberia. In spite of the freezing temperatures of New England, Newfoundland and the Azores, and the high altitude flying of the Pan American Constellation, the animals reached Monrovia in an apparently healthy condition. The original batch consisted of 9 white rabbits, 16 guinea pigs, 12 white rats, and 18 white mice, all young adults. Adequate cages and a well-built, well-ventilated animal house were constructed shortly after the arrival of the animals. The animals were caged in groups of three, one male and two females of the same species to each cage. Food was obtained from local gardens and the open market, and water from a nearby well. The quarters and cages were kept sanitary by laborers who also assisted in the frequent inspection of the animals for infections and infestations. Pregnant animals were placed in individual cages. In addition to the animals from the National Institutes of Health, there were transients in the colony taken in either for acute experiments or for observation for suspected rabies. At one time or another these transients included dogs, cats, native wild rats, shrews, chickens, canaries, snakes, iguanas, small lizards, frogs, fishes, turtles and others.

General observations on the stock animals during the first months of adjustment—During the first 6 weeks in Monrovia there was considerable difficulty in getting local clean food substitutes for the staple rations to which the animals had become accustomed at the N. I. H. laboratories. There was also some difficulty in getting nonpolluted water in sufficient quantities, at that season of the year in Monrovia. The protection of the animals from a variety of insects including the vicious "Driver" ants, mites, and larvae of Cordylobia sp., and from the dermatomycotic infections was an additional problem.

The first tragedy in the colony was an outbreak of *Salmonella typhimurium* and other salmonella infections which resulted in the death of all female white rats, leaving only 4 male adults and no offspring; of 2 white mice, leaving 16 adults and 21 young, and of 3 guinea pigs, leaving 13 adults and no offspring. During this period 3 white rabbits became infested with Tumbu fly maggots with resulting secondary skin lesions. Two died—one from a secondary skin infection and the other from a terminal gastro-enteritis.

This outbreak was brought under control by adding one-half teaspoonful of sulfadiazine to every quart of water used for drinking and for washing of green food; isolation of all sick animals in separate cages and the free use of 3 percent solution of Cresylone (a saponified cresylic acid) in water for cleaning of cages and quarters; spraying quarters with DDT, and local treatment of the open sores caused by the maggots, mites and/or fungus infections and the secondary pyogenic invaders.

With the outbreak apparently controlled and the animals eating well and looking healthy, the unexpected happened. Cannibalism developed and increased to an alarming degree. Within 2 weeks all the young mice and those born during the period were killed and eaten, chiefly by their mothers, which is unusual. The few guinea pigs born during the period were killed and eaten and there was evidence of young rabbits born during the night being eaten before the next morning. When young were not available to eat, the animals began to fight among themselves and whenever an adult was killed, the victors promptly devoured the victim. This threat to the colony was controlled by increasing the protein and sodium chloride in the diet; by improving the bedding in the cages, so that the young would not be bruised thus offering bleeding parts as a temptation for the adults to kill and devour; and by sacrificing, by acute experiments, the repeated offenders when caught in the act of cannibalism. At the end of 3 months the colony appeared to be stable with a group of healthy adults, but only the mice breeding.

Rabbits—The diet of the rabbits, with some variation, consisted of sweet potato tops and tubers; cassava (*Manihot utilissima*) tops and tubers; sugar cane leaves and stalks; and a variety of local grasses and leaves. Even the cost of the items of this limited diet was 13 cents per rabbit per day at Monrovia market prices. The cost of a diet of concentrated rabbit rations or of cabbages, carrots, white potatoes, and turnips, as given to rabbits in the United States is prohibitive in Liberia.

From all outward appearances these rabbits were healthy on the diet provided, but for 9 months there was not a single offspring from 4 adult females and 3 adult males even though adequate opportunities were given for breeding. Three females and two males were continued at the Monrovia station on the above diet for 6 months longer without a single offspring. In the light of the 60-day gestation period, we concluded that the few young which were born during the cannibalism flare-up were the result of conceptions which took place before the rabbits reached Monrovia.

At the end of the first 9 months of the observations, we were faced with the following questions: (a) Were the rabbits temporarily or

permanently sterilized by the high flying trip to Liberia? (b) Is the diet inadequate to stimulate breeding? (c) Are the differences between the temperate climate and the humid high temperature along the coast of Liberia, sufficient to block the breeding instinct? (d) Do the lack of runways and contact with the ground interfere with the desire to copulate, or the ability of one of the sexes to reproduce?

In an attempt to answer these questions, the following observations were made:

The rabbits were not permanently sterilized because active spermatazoa were obtained from penile strippings following massages of the testes, and the injection of the urine of pregnant women as A–Z tests gave the normal swelling and hemorrhage of ovarian follicles. Incidentally none of the male rabbits at Monrovia were ever observed in an attempt at coitus.

Since the diet was certainly not ideal, but the most economical available, the vegetables were grown in the Monrovia area where the soil is known to be deficient in at least 2 inorganic elements—calcium and phosphorous,[2] and the average coastal temperature might be too high to stimulate copulation, a pair of white rabbits (male and female) and 2 females and one male of a local strain of rabbits obtained from the Firestone rubber plantation in Liberia were sent to the Ganta Mission. Ganta is located at an elevation of 1,200 feet, while Monrovia is at sea level. It has a richer surrounding soil, a mean night temperature of about 10 degrees lower than Monrovia and a lower humidity and rainfall (80 inches compared with 170 inches per year at Monrovia).

At Ganta, the rabbits were given the same items of food as at Monrovia, with the addition of elephant grass. The diet was practically the same or differed only in the amount of different elements which the sugar cane, cassava or sweet potatoes obtained from the soil or water of this district. The breeding results were startling. The second day after arriving in Ganta, the white male began to show unusual copulative activities. The copulation acts were vigorous, and the phallic organs would remain extruded for 15–20 minutes after coitus even though the animal was lifted vigorously from the enclosure and handled roughly.

From these observations, one or more of the following elements seem to be in operation: cooler nights, lower humidity, or higher altitude. The average night temperature at Ganta is about 73° F.

During the 6 months these rabbits were at Ganta, two litters of young rabbits were born to one female. These included a litter of 6 and one of 8 healthy offspring. During 15 months, the 3 females and

[2] The soil of the Monrovia area has only about 18 pounds of phosphorus per acre when between 50–75 pounds per acre would be a better average for good vegetation.

2 males of the same shipment, remaining in Monrovia, did not produce a single offspring.

In answer to the question of runway space and ground contact, special indoor and outdoor runs were constructed for the animals at Monrovia, remaining on the same diet, without any change in the breeding results; while those at Ganta were breeding satisfactorily in spite of the absence of a runway and ground contact. Incidentally, rabbits subjected to the soil and wet vegetation of the Ganta district occasionally show Schistosoma sp. ova in their colons.

Guinea pigs—The diet of the guinea pigs in Monrovia was essentially the same as that for the rabbits with the occasional addition of a palm nut. The average cost was 4½ cents per animal per day at the Monrovia prices. For more than 15 months, these guinea pigs appeared to be in good health with the exception that those in Monrovia did not produce offspring other than those born shortly after their arrival in Monrovia—the result of conceptions which occurred before they reached Liberia.

At the end of 9 months of observation, one male and two female guinea pigs were transferred to Ganta. There they experienced the same changes in altitude, humidity, temperature and annual rainfall mentioned in the section for rabbits. Their Monrovia diet was supplemented by fresh shelled peanuts, fresh corn, plums, guava, and fresh beans. They were housed in the usual shipping cages with local straw and sawdust for bedding. At the end of 6½ months at Ganta, one of the original females had delivered 2 litters and was again pregnant. Females of the first litter delivered at Ganta appeared to be pregnant. The change in environment and diet seemed to be factors here.

White rats—The 4 adult males surviving the salmonella outbreak remained healthy on a diet consisting of the following local items given alone with their Krobo market names: unpolished rice (Mo); corn (whole grains) (Bulu); cheese (Cheese); ripe bananas (Koujon); sweet potatoes (Pala); sweet biscuit (occasionally) (Pede); bread (Flo); palm nuts (Hwi); milk; coconuts; avocados.

The drinking water contained 0.5 to 1.0 gram of iodized sodium chloride per liter, and at intervals 250 to 500 mgms. of sulfadiazine per liter was added. The feeding cost for rats for a colony of more than 50 is two-thirds of a cent per animal per day.

Before arriving at the staple diet given above, many combinations were tried including the mixed nuts, table scraps, store bought canned goods, ripe plantains (Musa sapientum) and several of the items used for rabbits. They were discarded either because they were too expensive or the animals did not eat them well.

Replacements for the rats lost in the salmonella outbreak were procured from the United States. These bred well at Monrovia. The present number of offspring from the white rats is between 200 and 300. Many of the rats have been used for *Trypanosoma gambiense* and cercariae of *Schistosoma hematobium* experimentations.

White mice—The white mice have bred well from the beginning. The diet worked out for the rats was satisfactory for the mice, which now have more than 500 offspring. Many have been used in Trypanosoma, Borrelia, and leprosy experiments. The cost of feeding a colony of more than 50 white mice with the ration combination given above is one-sixth of a cent per day per mouse. Two of the most important items for the successful raising of mice in the tropics are a good water supply, and frequent cleaning of cages with a liberal use of disinfectant in the water used for that purpose. Newly delivered mice must not be handled or moved for about 10 days.

Discussion

A large colony of animals adapted to the tropics and obtained at reasonable cost is very much needed in tropical West Africa. Where refrigeration and storage space free from vermin are at such a great premium, the feeding item will probably have to be taken care of from local purchases. Those interested in establishing large research units in the tropics, may find it economically advisable to grow their own animal food. Cross breeding of the temperate zone experimental animals with native stocks seems to be indicated.

Summary and Conclusion

We have recorded some of the factors involved in maintaining a healthy animal colony in tropical West Africa, the most important of which appear to be:

1. Precautions necessary to avoid infection and infestation.
2. Provision for adequate satisfactory food at a reasonable price.
3. An average night temperature below 75° F. for at least part of the year.

Staple diets have been worked out with average feeding costs for rabbits of 13 cents per day; guinea pigs, 4½ cents per day; white rats, two-thirds cent per day; and white mice, one-sixth cent per day.

These facts may be of value to those planning laboratory researches in this section. Our observations suggest that American bred white rabbits and guinea pigs will not breed well in the moist hot climates of the coast of Liberia, especially in the Monrovia area, and that a higher altitude and/or a lower night temperature may be essential to rapid reproduction of these two types of animals.

INCIDENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED DECEMBER 25, 1948

Of the total of 2,165 cases of influenza reported for the week (last week 2,644, 5-year median 3,684), 5 States reported 1,858 (last week 2,284), as follows (last week's figures in parentheses): Virginia 398 (288), South Carolina 131 (271), Arkansas 158 (178), Texas 1,032 (1,378), Arizona 139 (169). Only one other State (Colorado, 72) reported more than 40 cases. Since July 31 (approximate average date of seasonal low incidence), 33,449 cases have been reported, as compared with 32,861 for the same period last year, 309,301 in 1945, the highest corresponding figure of the past 5 years, and a 5-year (1943–47) median of 32,861.

A total of 6,147 cases of measles was reported, as compared with 5,984 last week and a 5-year median of 2,696. Six States reporting currently an aggregate of 3,362 cases are as follows (last week's figures in parentheses): Massachusetts 1,017 (896), New York 322 (414), Pennsylvania 327 (373), Maryland 402 (290), Virginia 402 (172), Texas 892 (712). No other State reported more than 271 cases. The cumulative figure since September 4 (average seasonal low date) is 45,343, the highest for a corresponding period since 1943 (55,289). The 5-year median for the period is 23,401.

Of the total of 203 cases of poliomyelitis (last week 264, 5-year median 89), only 2 States reported more than 11 cases—South Dakota 32 (last week 16) and California 68 (last week 90). The total for the year to date is 27,484, as compared with 25,098 for the same period in 1946 and a 5-year median of 13,648.

During the week, Idaho reported 4 cases of smallpox, and New York and Pennsylvania each 1 case of anthrax. Of 38 cases of tularemia reported (last week 34, 5-year median 25), 10 occurred in Missouri, 6 in Indiana, 5 in Arkansas, and 17 in 12 other States.

A total of 8,708 deaths from all causes was recorded during the week in 91 large cities in the United States, as compared with 9,347 last week, 8,806 and 9,290, respectively, for the corresponding weeks of 1947 and 1946, and a 3-year (1945–47) median of 9,290. The total for the year to date is 471,682, as compared with 473,413 for the same period last year. Infant deaths totaled 592, as compared with 727 last week and a 3-year median of 639. The cumulative figure is 34,090, as compared with 37,433 for the same period last year.

Telegraphic case reports from State health officers for week ended December 25, 1948

(Leaders indicate that no cases were reported)

Division and State	Diphtheria	Encephalitis, infectious	Influenza	Measles	Meningitis, meningococcal	Pneumonia	Poliomyelitis	Rocky Mountain spotted fever	Scarlet fever	Smallpox	Tularemia	Typhoid and paratyphoid fever [d]	Whooping cough	Rabies in animals
NEW ENGLAND														
Maine				83	1	11			12			1	30	
New Hampshire			1	9		1								
Vermont	1			160					6			1	9	
Massachusetts	12			1,017	1	32	1		139				56	
Rhode Island				16					5			1	1	
Connecticut		1	2	44	1	29			36				2	
MIDDLE ATLANTIC														
New York	4	1	[b] 1	322	2	163	6		• 140			2	70	13
New Jersey			2	54		36	4		45				17	
Pennsylvania	8		[b]	327	4		1		104		1	8	65	4
EAST NORTH CENTRAL														
Ohio	9			19	1	36	1		182		1		33	13
Indiana	5		2	7	3	2	3		74		6		3	16
Illinois	2		1	29	5	60	4		134		3	1	18	1
Michigan [a]	2		4	271		81	7		187			1	27	9
Wisconsin			14	195	4	3	1		72				15	
WEST NORTH CENTRAL														
Minnesota	1			7	2	1	11		42				10	
Iowa				20		1	9		22				3	1
Missouri	3		5	80	3	28			23		10	2	1	
North Dakota			1	8					1					
South Dakota				2			32		1					
Nebraska			7	6			1		4					
Kansas	2		13	56	2	14	8		39		2		53	
SOUTH ATLANTIC														
Delaware				4					2					
Maryland [a]	7	1	3	402	2	23	1		• 16			2	9	
District of Columbia	1			16		13			4					
Virginia	6		398	402	1	71	2		24			3	13	
West Virginia	3		29	2	1	4	2		4				2	
North Carolina	13			40	1				23		2		9	
South Carolina	2	2	131			32	2		7				2	2
Georgia	9		2	15	1	7	2		26		2	1		12
Florida	5		1	80		4	3				1			3

Florida	5		1	80		4	3				1			3
EAST SOUTH CENTRAL														
Kentucky	11			29	1	28			38		1	1	3	4
Tennessee	3		20	70		19	3		49		1	1	1	
Alabama	15		34	103		25	2		5		1		5	8
Mississippi [a]	3		2	2	1	16	1		4			1	1	
WEST SOUTH CENTRAL														
Arkansas	2		158	195		31			3		5			1
Louisiana	1								2					
Oklahoma	2		40	65	1	21	1		19		1	2	1	1
Texas	13		1,032	892	2	123	8		16			1	60	38
MOUNTAIN														
Montana			2	9			1		18				1	
Idaho		1	1	79		7			[c] 9	4				
Wyoming				9		4			1				3	
Colorado	3		72	85	2	27			18		1		5	
New Mexico			3	82		6	1		14					
Arizona	7		139	65		11			7			1	6	1
Utah [a]	2		2	197		3	9		7				3	
Nevada							1							
PACIFIC														
Washington	1		3	112		1	3		24				12	
Oregon	1		25	209	2	12	4		25				15	
California	7	1	15	257	7	13	68		56			3	21	4
Total	166	7	2,165	6,147	51	999	203		1,689	4	38	33	585	
Median, 1943–47	319	5	3,684	2,696	127		89	1	2,397	5	25	42	1,541	
Year to date, 51 weeks	9,522	561	172,264	596,757	3,200		27,484	522	76,379	61	1,003	3,554	72,337	
Median, 1943–47	13,795 (27th)	622	334,374 (30th)	594,435 (35th)	7,837 (37th)		13,648 (11th)	467	137,454 (32nd)	343 (35th)	789	4,814 (11th)	122,344 (39th)	
Seasonal low week ends	July 10		July 31	Sept. 4	Sept. 18		Mar. 20		Aug. 14	Sept. 4		Mar. 20	Oct. 2	
Since seasonal low week	4,912		33,449	45,343	764		27,134		20,763	11		3,081	9,414	
Median, 1943–47	7,265		32,861	23,401	1,342		13,251		36,360	70		4,190	24,808	

[a] Period ended earlier than Saturday.
[b] New York City and Philadelphia only, respectively.
[c] Including cases reported as streptococcal infection and septic sore throat.
[d] Including paratyphoid fever, reported separately, as follows: Michigan 1; California 1. Salmonella infections, not included, were reported as follows: Massachusetts 2; New York 1.

Anthrax: New York 1; Pennsylvania 1.
Alaska: Pneumonia 1; scarlet fever 3; streptococcus sore throat 3.
Territory of Hawaii: Influenza 1; measles 278; lobar pneumonia 3.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended December 4, 1948.—During the week ended December 4, 1948, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		78		310	655	110	122	178	267	1,720
Diphtheria				9	5	1				15
Dysentery, bacillary				6				2		8
German measles		1		26	9		16	2	10	64
Influenza		37			8					45
Measles		107	3	365	99	122	26	105	174	1,001
Meningitis, meningococcal		1		1	2					4
Mumps		21	2	137	135	51	27	13	70	456
Poliomyelitis				1	7	2	1			11
Scarlet fever		6	2	152	65	8	9	7	8	257
Tuberculosis (all forms)		3	12	136	16	18	9		44	238
Typhoid and paratyphoid fever				4			1			5
Undulant fever					2				1	3
Venereal diseases:										
Gonorrhea		13	18	71	68	18	26	33	99	346
Syphilis		4	10	67	38	10	4		14	147
Whooping cough		13		137	27	1	4	5		187

ITALY

Influenza.—Under date of December 8, 1948, the press reported a severe outbreak of influenza in Rome. According to later official information, epidemic proportions were reported in Rome and Milan, and it was stated to be widespread not only in the Central and Southern Provinces of the mainland but also in Sardinia. Still later information stated that the epidemic had spread to the Northern Provinces.

The disease is stated to run a mild clinical course of 4 to 5 days' duration, with neuralgia and fever for 2 or 3 days. Fatal pulmonary complications were said to have been observed only among the aged. The number of deaths from bronchopneumonia had not exceeded the normal for the season. Type B virus was identified in the Sardinia laboratory.

In view of the benign character of the disease, the Italian health authorities do not regard the situation with alarm.

MAURITIUS

Poliomyelitis.—Increase recently in the incidence of acute poliomyelitis in Mauritius was indicated in telegraphic information received by the World Health Organization on December 9, 1948. During the period November 19–December 7, 22 cases were reported, of which 10 were stated to have occurred in the 3-day period December 5–7.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

Note.—The following reports include only items of unusual incidence or of special interest and the occurrence of these diseases, except yellow fever, in localities which had not recently reported cases. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Plague

British East Africa—Tanganyika—Central Province.—Plague has been reported in Central Province, Tanganyika Territory, British East Africa, as follows: Week ended October 30, 1948, 14 cases with 10 deaths; week ended November 6, 5 cases, 2 deaths.

Indochina (French)—Annam.—Reports of plague in Annam State, French Indochina, have been received as follows: Week ended November 27, 1948, 36 cases with 8 deaths; week ended December 4, 15 cases with 5 deaths; week ended December 11, 8 cases with 2 deaths.

Rhodesia (Northern).—For the week ended November 27, 1948, 8 cases of plague with 6 deaths were reported in Northern Rhodesia, and 8 cases, 6 deaths were reported during the week ended December 4, 1948.

Smallpox

British East Africa—Tanganyika.—During the week ended November 6, 1948, 65 cases of smallpox with 6 deaths were reported in Tanganyika Territory, British East Africa.

Burma—Rangoon.—For the week ended December 11, 1948, 17 cases of smallpox were reported in the city of Rangoon, Burma.

China—Amoy.—An outbreak of smallpox is reported to have occurred at Amoy, China, during the period October 17–November 27, among a group of army recruits arriving on October 6, from the interior of Fukien Province to await transport to Shanghai and North China. The first case was reported on October 17, and 5 additional cases at the beginning of November. Up to November 27 a total of 69 cases had been reported, including 3 cases among civilian workers attached to the regiment. All necessary precautions to prevent spread of the disease were stated to have been taken.

Iran—Abadan.—During the period November 6–27, 1948, 28 cases of smallpox were reported in the port of Abadan, Iran.

Iraq.—Smallpox has been reported in Iraq as follows: Week ended December 11, 1948, 132 cases with 21 deaths, including 38 cases, 8 deaths in Baghdad, and 3 cases, 2 deaths in Basra; week ended December 18, 92 cases with 26 deaths, including 23 cases, 6 deaths in Baghdad, and 3 cases, 1 death in Basra.

Rhodesia (Northern).—Smallpox has been reported in Northern Rhodesia as follows: Week ended November 27, 1948, 670 cases with 211 deaths; week ended December 4, 672 cases with 29 deaths.

Syria.—For the week ended November 27, 1948, 159 cases of smallpox were reported in Syria, including 17 cases in Aleppo, and for the week ended December 4, 149 cases were reported, including 14 cases in Damascus.

Transjordan.—During the week ended December 4, 1948, 11 cases of smallpox were reported in Transjordan.

Typhus Fever

Brazil—Porto Alegre.—During the week ended December 4, 1948, 8 cases of typhus fever with 3 deaths were reported in Porto Alegre, Brazil.

Guatemala.—During the period August 1–31, 1948, 14 cases of typhus fever with 5 deaths were reported in Guatemala, and during the period September 1–30, 39 cases with 15 deaths were reported.

Italy.—During the period September 21–30, 1948, 25 cases of typhus fever were reported in ports in Italy, 11 of which were stated to have occurred in Genoa and 6 in Rome.

Japan—Tokyo.—During the week ended November 6, 1948, 3 cases of typhus fever were reported in Tokyo, Japan.

Malay States (Federated).—During the week ended December 4, 1948, 14 cases of murine typhus fever were reported in the Malay States Federation.

Portugal—Azores—Ponta Delgada.—During the month of July, 1948, 1 fatal case of typhus fever was reported in Ponta Delgada, Azores Islands.

Yellow Fever

No reports of yellow fever were received during the current week.

DEATHS DURING WEEK ENDED DEC. 18, 1948

[From the Weekly Mortality Index, issued by the National Office of Vital Statistics]

	Week ended Dec. 18, 1948	Corresponding week, 1947
Data for 93 large cities of the United States:		
Total deaths	9,447	9,643
Median for 3 prior years	9,643	
Total deaths, first 51 weeks of year	467,632	469,177
Deaths under 1 year of age	740	654
Median for 3 prior years	654	
Deaths under 1 year of age, first 51 weeks of year	33,963	37,246
Data from industrial insurance companies:		
Policies in force	70,759,752	66,963,740
Number of death claims	12,140	12,712
Death claims per 1,000 policies in force, annual rate	9.0	9.9
Death claims per 1,000 policies, first 51 weeks of year, annual rate	9.2	9.2

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